

## 1. Demographic Information

### **Background**

During the spring 2023 semester term the Ohio Department of Higher Education (ODHE) and Ohio Articulation and Transfer Network (OATN) held stakeholder meetings to outline recent workforce and industry needs in the state. During discussion, representatives working on the Ohio Association of Community Colleges (OACC) Intel grant recommended the creation of various Transfer Assurance Guide (TAG) and Career-Technical Assurance Guide (CTAG) course learning outcomes be developed to meet industry demand and future workforce opportunities. As a result, the OATN arranged for faculty subject matter experts representing two-year and four-year Ohio public institutions of higher education to meet and begin learning outcome development for future statewide guarantees. Initial meetings and learning outcome development discussions lead to the dissemination of early research and proposed requirements to meet industry requests.

After some discussion, the TAG and CTAG faculty writing panels have recommended the creation of TAG and CTAG course learning outcomes for the following areas:

- **Introduction to Semiconductors and Cleanroom Processing** (TAG)
- **Introduction to Manufacturing** (TAG)
- **Vacuum Systems** (CTAG)

### **What we need from you:**

With work in these areas gearing up quickly, please arrange to have appropriate faculty at your institution complete the survey as soon as possible but **no later than May 5, 2023**. We are collecting **only one response** per institution.

With this work tied to workforce demands that benefit the students of Ohio, we realize many institutions are currently working to develop a course to meet proposed learning outcomes or will need to develop a course. The survey asks your institution if they agree or disagree with the proposed course learning outcomes and to provide feedback on how your institution envisions courses to apply at your campus. You will find a copy of the proposed TAG and CTAG course learning outcomes attached as reference.

The online survey is available through the following link: <https://www.surveymonkey.com/r/KXX3W6R>

Important Note: You must complete the survey through the link provided above. The attached PDF is for reference only. **Do not use the PDF version to respond to the survey.**

Thank you in advance for your assistance. If you have any questions, please contact Jessi Spencer, Senior Director of Policy, Budget, and Constituent Relations at 614-728-4706 or [jspencer@highered.ohio.gov](mailto:jspencer@highered.ohio.gov) or Nikki Wearly, Senior Director of Career-Technical Education Transfer Initiatives at 614-728-2662 or [nwearly@highered.ohio.gov](mailto:nwearly@highered.ohio.gov).

### **\* 1. Demographic Information about the Person Completing this Survey**

Name	<input type="text"/>
Institution	<input type="text"/>
Department	<input type="text"/>
Title	<input type="text"/>
Email	<input type="text"/>
Phone	<input type="text"/>

\* 2. Please Indicate the Type of Institution that you represent

☐ Two-Year Institution

☐ Four-Year Institution

## 2. TAG: Introduction to Semiconductors and Cleanroom Processing

**4 Semester Hours**

**Pre-Requisite: None**

**General Course Description:**

**This course is a broad introduction to semiconductor and integrated circuit manufacturing from a technician and maintenance perspective. In lecture, students will learn about what a cleanroom is, why it's important to gown up, to work in a cleanroom and have a broad non-quantitative introduction to semiconductor processing such as diffusion, deposition, lithography, and dry and wet etching, planarization, and testing. All students will understand academic and career fields in the semiconductor ecosystem. They will practice the protocols for cleanroom suit gowning. Using a computer, students will access and follow standard operating procedures and checklists while observing safety requirements. This course emphasizes the use of hand-tools to perform inspection, maintenance and repair of mechanical fasteners and fixtures associated with semiconductor fab and sub-fab equipment.**

1. Below are the TAG learning outcomes for Introduction to Semiconductors and Cleanroom Processing listed individually. Do you agree with these outcomes?

	Yes- I agree with the required (essential) learning outcome	No- required (essential) learning outcomes should be optional (non-essential)	No- I do not agree learning outcomes should be required (essential) or optional (non-essential)
1. Demonstrate the capability of working safely in a cleanroom environment for appropriate gowning and cleanliness standards. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Articulate how a semiconductor wafer is manufactured and processed to become an integrated circuit including basic semiconductor concepts. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Perform standard operating procedures efficiently in a semiconductor manufacturing cleanroom environment with a focus on participating as a team in pre-task planning, and accurately completing tasks in a digital checklist accessed in shared productivity tools. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Articulate chemistry and chemical safety used in semiconductor fabrication with an awareness of semiconductor material properties. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Please identify how your institution envisions the proposed TAG course Introduction to Semiconductors and Cleanroom Processing to apply on your campus (include all programs below)

3. Comments:

### 3. TAG: Introduction to Manufacturing

**3 Semester Hours**

**Pre-Requisite: None**

**General Course Description:**

**This course introduces students to modern manufacturing organizations, technology, business systems, and problem solving. Provides the fundamentals of Lean Manufacturing, Quality Systems and Statistical Process Control, documentation and standard operating procedures, concepts in measurement, geometric dimensioning and tolerancing, visualization and graphics.**

1. Below are the learning outcomes for TAG Introduction to Manufacturing listed individually. Do you agree with these outcomes?

	Yes- I agree with the required (essential) learning outcome	Yes- I agree with the optional (non-essential) learning outcome	No- required (essential) learning outcomes should be optional (non-essential)	No- optional (non-essential) learning outcomes should be required (essential)	No- I do not agree learning outcomes should be required (essential) or optional (non-essential)
1. Examine the manufacturing organization, technology, business systems, and goals of each segment such as safety, quality, maintenance, operations, engineering, supply chain, and finance. (non-essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Demonstrate problem-solving, critical thinking and communication skills. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Describe the fundamentals of Lean Manufacturing. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Articulates basic principles and purpose of Quality Control and Quality Systems and examine the basic concepts for Statistical Process Control (SPC). * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Utilize standard operating procedures/checklists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

in paper or digital  
format. \* (essential)

6. Documents work  
using industry  
records, standard  
operating procedures  
(SOPs), and travelers  
that provide  
traceability. \*  
(essential)

☐☐☐☐☐

7. Examine  
maintenance  
strategies such as  
predictive, time  
based, preventative,  
and corrective. \*  
(essential)

☐☐☐☐☐

8. Use basic  
measurement and  
precision tools and  
techniques. \*  
(essential)

☐☐☐☐☐

9. Examine  
visualization and  
graphics as a major  
component in  
engineering  
technology, graphics,  
and visualization  
techniques. \*  
(essential)

☐☐☐☐☐

10. Examine the  
basic concepts of  
Geometric  
Dimensioning and  
Tolerancing. \*  
(essential)

☐☐☐☐☐

11. Analyze  
measurements and  
perform technical  
calculations. \*  
(essential)

☐☐☐☐☐

2. Please identify how your institution envisions the proposed TAG course Introduction to Manufacturing to apply on your campus (include all programs below)

3. Comments:

## 4. CTAG: Vacuum Systems

**3 Semester Hours**

**Pre-Requisite: None**

**General Course Description:**

**This class focuses on the mechanical maintenance, processing, and data collection of vacuum systems typically used in semiconductor processes such as thin film deposition, ion implantation, and reactive ion etching. Lectures consist of a broad introduction to the use of vacuum pumps in semiconductor manufacturing and how to measure vacuum pressure within a multi-pump system. Students will gown up in a bunny suit and work in a cleanroom environment to work with vacuum systems, measure quantities of pressure, and check piping for pressure leaks while recording data on a business communication platforms.**

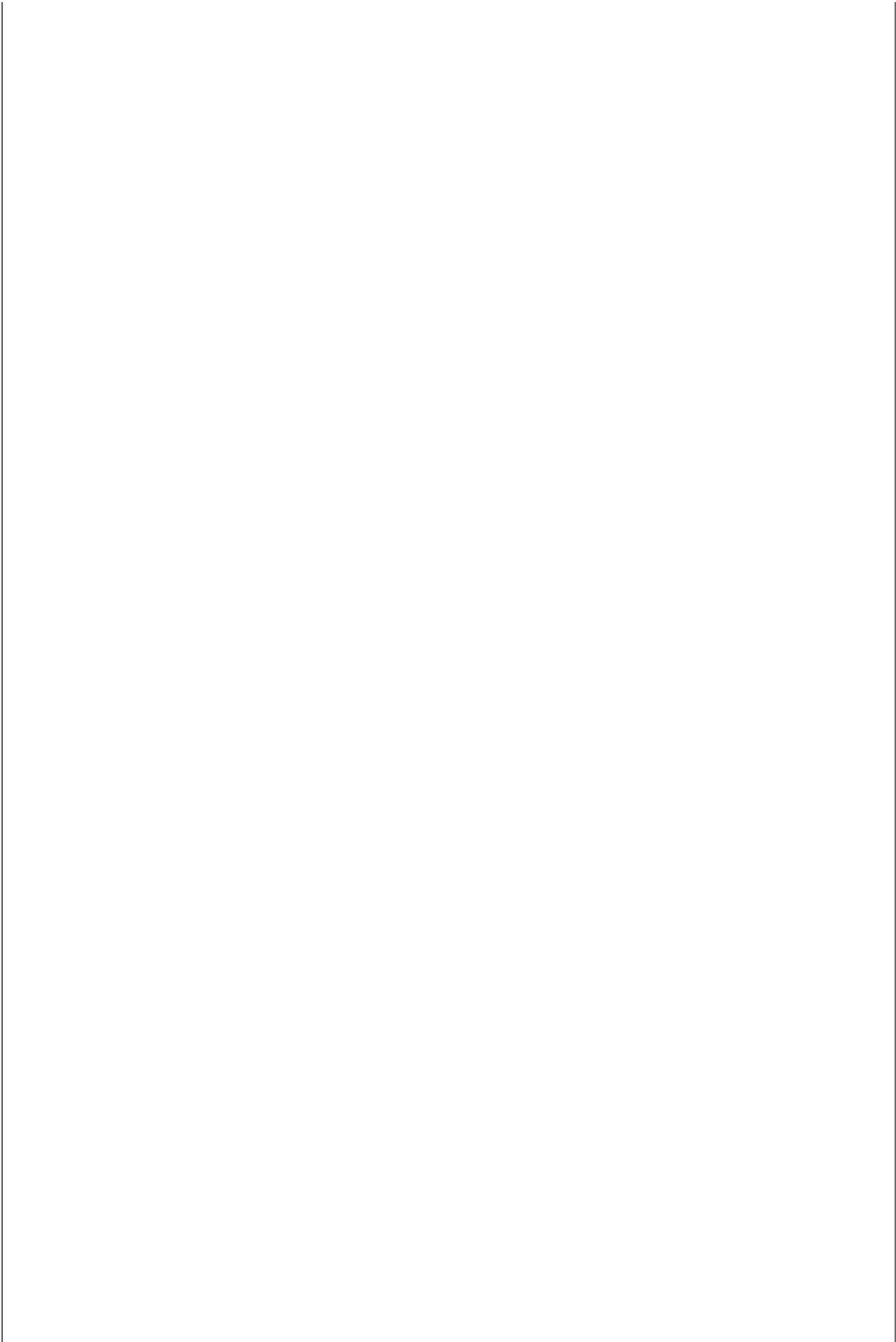


1. Below are the learning outcomes for CTAG Vacuum Systems listed individually. Do you agree with these outcomes?

	Yes- I agree with the required (essential) learning outcome	No- required (essential) learning outcomes should be optional (non-essential)	No- I do not agree learning outcomes should be required (essential) or optional (non-essential)
1. Explain the operational mechanisms and process use of vacuum pumps used in the semiconductor industry including pressure units used in high and low vacuum systems. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Demonstrates the ability to safely use tools and digital checklists commonly used in vacuum system maintenance while gownned up in a cleanroom environment. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Demonstrate the ability to safely test, troubleshoot, and fix a vacuum pump system with a leak using tools while gownned up in a cleanroom environment. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Define Pressure. Define vacuum system, be able to understand units used in measuring vacuum and pressure systems. * (essential)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Please identify how your institution envisions the proposed CTAG course Vacuum Systems to apply on your campus (include all programs below)

3. Comments:



## 5. Survey Completion

**Thank you for completing this survey!**